

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

5 Patent Application

Applicant(s): Fischer et al.

Case: 46-3

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Group: 2627

Examiner: Dismery E. Mercedes

15 Title: Long Hold Time Sample and Hold Circuits

20 APPEAL BRIEF

Mail Stop Appeal Brief - Patents

Commissioner for Patents

P.O. Box 1450

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Sir:

30 Applicants hereby appeal the final rejection dated December 27, 2006, of claims 1 through 20 of the above-identified patent application.

REAL PARTY IN INTEREST

The present application is assigned to Agere Systems Inc., as evidenced by an assignment recorded on March 31, 2004 in the United States Patent and Trademark Office at
35 Reel 015168, Frame 0913. The assignee, Agere Systems Inc., is the real party in interest.

RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

STATUS OF CLAIMS

Claims 1 through 20 are presently pending in the above-identified patent application. Claims 1, 7, 8, and 13 are rejected under 35 U.S.C. §102(e) as being anticipated by Luo (United States Patent Number 6,111,467), claims 3, 4, 10, and 11 are rejected under 35 U.S.C. §103(a) as being unpatentable over Luo in view of Beauducel et al. (United States Patent Number 4,352,070), claims 6 and 12 are rejected under 35 U.S.C. §103(a) as being unpatentable over Luo in view of Mills et al. (United States Patent Number 5,172,117), and claims 2, 5, and 9 are rejected under 35 U.S.C. §103(a) as being unpatentable over Luo in view of Sandusky et al. (United States Patent Number 5,825,571). The Examiner indicated that claims 14-20 are allowed. Claims 1, 4, 7, 8, 11, and 13 are being appealed.

STATUS OF AMENDMENTS

There have been no amendments filed subsequent to the final rejection.

SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 1 is directed to a sample and hold circuit having an input and an output (FIG. 3: 300 and page 4, lines 25-30; FIG. 4: 400 and page 5, lines 17-30), comprising: at least one capacitive element for retaining a charge, the at least one capacitive element connected to a node between the input and the output (FIG. 3: C0; FIG. 4: C0; page 4, line 25, to page 5, line 16); at least one input switch for selectively connecting the at least one capacitive element to the input (FIG. 3: S0, S1; FIG. 4: S1; and page 4, line 25, to page 5, line 30); at least one output switch for selectively connecting the at least one capacitive element to the output (FIG. 3: S2, S3; FIG. 4: S2, S3; page 4, line 25, to page 5, line 30); and an amplifier (FIG. 3: A1; FIG. 4: A1) connected to the node, wherein the amplifier has an offset voltage and wherein a voltage drop across at least one of the input and output switches is limited to the offset voltage (page 5, lines 1-10).

Independent claim 8 is directed to a method (page 4, line 25, to page 5, line 30) for reducing leakage in a sample and hold circuit having at least one capacitive element (FIG. 3: C0; FIG. 4: C0) for retaining a charge, the method comprising the steps of: configuring at least one input switch (FIG. 3: S0, S1; FIG. 4: S1) to selectively connect the at least one capacitive

element to the input (page 4, line 25, to page 5, line 30); configuring at least one output switch (FIG. 3: S2, S3; FIG. 4: S2, S3) to selectively connect the at least one capacitive element to the output (page 4, line 25, to page 5, line 30); and limiting a voltage drop across at least one of the input and output switches to an offset voltage of an amplifier (FIG. 3: A1; FIG. 4: A1) connected to the at least one capacitive element (page 5, lines 1-10).

Claims 4 and 11 require at least two switches (FIG. 6: 611-614) associated with at least one of the input and output switches (FIG. 6: S1-S3), wherein the at least two switches selectively connect at least one of the input and output switches to an output of the amplifier in a hold mode or standard voltages in a write mode to reduce leakage effects due to parasitic diodes in the at least one of the input and output switches (page 6, line 10, to page 7, line 5; FIG. 6: 600).

Claims 7 and 13 require wherein the limited voltage drop across at least one of the input and output switches reduces a leakage of the sample and hold circuit (page 4, line 25, to page 5, line 30).

STATEMENT OF GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1 and 8 are rejected under 35 U.S.C. §102(e) as being anticipated by Luo. Claims 4 and 11 are rejected under 35 U.S.C. §103(a) as being unpatentable over Luo in view of Beauducel et al. Claims 7 and 13 are rejected under 35 U.S.C. §102(e) as being anticipated by Luo.

ARGUMENTS

Independent Claims 1 and 8

Independent claims 1 and 8 are rejected under 35 U.S.C. §102(e) as being anticipated by Luo. In particular, the Examiner asserts that Luo discloses a sample and hold circuit. Among other features, the Examiner asserts that Luo also discloses (i) at least one capacitive element for retaining a charge, said at least one capacitive element connected to a node between said input and said output (citing element C1 in FIG. 1); (ii) at least one output switch for selectively connecting said at least one capacitive element to said output (citing element S3 of FIG. 1); and (iii) an amplifier connected to said node, wherein said amplifier has

an offset voltage and wherein a voltage drop across at least one of said input and output switches is limited to said offset voltage (FIG. 1: element 11; col. 3, lines 50-64)

Applicants note that, regarding element C1, Luo teaches that,

continuing to refer to FIG. 1 and FIG. 2, **during quarter period 2** switch S1 connecting the first transconductor 10 to the operational amplifier 11 is open, and switch S2 connecting the sample and hold capacitor C2 to the output of the operational amplifier 11 is closed allowing capacitor C2 to be charged up to a voltage equal to that on capacitor C1. **Switches S4a and S4b remain closed.** Switch S6 is closed to discharge the voltage on the parasitic capacitance at the output of the transconductor 10. **All other switches are open during quarter period 2.**

Continuing to refer to FIG. 1 and FIG. 2, **during quarter period 3** switch S0 is closed to discharge the voltage on the feed back capacitor C1. Switch S5a is closed to connect input voltage $k_2 V_R$ to the input of the transconductor 10 and **switch S5b is closed to connect a voltage reference $-V_R$ to the (+) input terminal of the current summing operational amplifier 11.** Switch S6 remains closed to discharge the voltage on the parasitic capacitance at the output of the transconductor 10. **All other switches are open during quarter period 3.**

Continuing to refer to FIG. 1 and FIG. 2, during quarter periods 4 and 5 switches S1, S5a and S5b are closed, and all other switches are open. The feedback capacitor C1 is charged for one half clock period by the output of the transconductor 10 from the reference voltage $-V_R$ to a voltage $-V_y$. During quarter period 6 switches S5a and S5b remain closed and S3 is closed allowing a voltage equal to that on capacitor C1 to be put onto capacitor C3. Switch S6 is closed to discharge the capacitance on the parasitic capacitance at the output of the transconductor 10, and all other switches are open.
(Col. 4, lines 23-53; emphasis added.)

Luo teaches that *switch S4b is closed and switch S5b is open during quarter 2, and that switch S4b is open and switch S5b is closed during quarter 3.* Thus, Luo actually teaches away from the present invention by teaching to **not limit** a voltage drop across at least one of the input and output switches *to an offset voltage of an amplifier connected to the capacitive element.* Independent claim 1 requires an amplifier connected to said node, *wherein said amplifier has an offset voltage and wherein a voltage drop across at least one of said input and output switches is limited to said offset voltage.* Independent claim 8 requires *limiting a voltage drop across at least one of said input and output switches to an offset voltage of an amplifier connected to said at least one capacitive element*

Thus, Luo does not disclose or suggest an amplifier connected to said node, wherein said amplifier has an offset voltage and wherein a voltage drop across at least one of said input and output switches is limited to said offset voltage, as required by independent claim 1, and does not disclose or suggest limiting a voltage drop across at least one of said input and output switches to an offset voltage of an amplifier connected to said at least one capacitive element, as required by independent claim 8

Claims 4 and 11

Claims 4 and 11 are rejected under 35 U.S.C. §103(a) as being unpatentable over Luo in view of Beauducel et al. Regarding claims 4 and 11, the Examiner acknowledges that Luo does not explicitly teach the limitation of claims 4 and 11, but asserts that Beauducel teaches two switches found between the input and output nodes in order to hold a voltage amount (col. 3, lines 1-20).

Applicants note, however, that neither Luo nor Beauducel disclose or suggest wherein switches selectively connect at least one input and output switches *to an output of an amplifier in a hold mode or standard voltages in a write mode to reduce leakage effects* due to parasitic diodes in the input and output switches. Claims 4 and 11 require wherein said at least two switches selectively connect at least one of said input and output switches to an output of said amplifier in a hold mode or standard voltages in a write mode to reduce leakage effects due to parasitic diodes in said at least one of said input and output switches.

Thus, Luo and Beauducel, alone or in combination, do not disclose or suggest wherein said at least two switches selectively connect at least one of said input and output switches to an output of said amplifier in a hold mode or standard voltages in a write mode to reduce leakage effects due to parasitic diodes in said at least one of said input and output switches, as required by claims 4 and 11.

Claims 7 and 13

Claims 7 and 13 are rejected under 35 U.S.C. §102(e) as being anticipated by Luo. Regarding claims 7 and 13, the Examiner asserts that “it is inherent that because the voltage drop cannot be greater than the voltage offset, hence it reduces the leakage effect in the circuit by maintaining the voltage offset during the operation of the circuit.”

Applicants note that, as argued above, Luo does *not* teach *to limit* a voltage drop across at least one of the input and output switches *to an offset voltage of an amplifier connected to the capacitive element*. Furthermore, Luo does *not* disclose or suggest wherein the limited voltage drop across at least one of the input and output switches *reduces a leakage of the sample and hold circuit*. Claims 7 and 13 require wherein said limited voltage drop across at least one of said input and output switches reduces a leakage of said sample and hold circuit.

Thus, Luo does not disclose or suggest wherein said limited voltage drop across at least one of said input and output switches reduces a leakage of said sample and hold circuit, as required by claims 7 and 13.

Additional Cited References

Beauducel was also cited by the Examiner for its disclosure of a resistor placed in parallel as disclosed in the sample and hold circuit of FIG. 4 (R_1). Although Beauducel is directed to a sample and hold circuit, Beauducel does *not* disclose or suggest the feature of *limiting* a voltage drop across at least one of the input and output switches *to an offset voltage of an amplifier connected to the capacitive element*.

Thus, Beauducel et al. do not disclose or suggest an amplifier connected to said node, wherein said amplifier has an offset voltage and wherein a voltage drop across at least one of said input and output switches is limited to said offset voltage, as required by independent claim 1, and do not disclose or suggest limiting a voltage drop across at least one of said input and output switches to an offset voltage of an amplifier connected to said at least one capacitive element, as required by independent claim 8.

Mills was also cited by the Examiner for its disclosure of a sample and hold circuit in which its hold time is 200 microseconds. Applicants note that Mills is directed to an analog to digital signal converter that includes an integrator and a sample and hold circuit. Mills does *not*, however, disclose or suggest the feature of *limiting* a voltage drop across at least one of the input and output switches *to an offset voltage of an amplifier connected to the capacitive element*.

Thus, Mills et al. do not disclose or suggest an amplifier connected to said node, wherein said amplifier has an offset voltage and wherein a voltage drop across at least one of said input and output switches is limited to said offset voltage, as required by independent claim

1, and do not disclose or suggest limiting a voltage drop across at least one of said input and output switches to an offset voltage of an amplifier connected to said at least one capacitive element, as required by independent claim 8.

Sandusky was also cited by the Examiner for its disclosure of a sample and hold circuit for a preamplifier in a disk drive. Applicants note that Sandusky is directed to a circuit for input switching for a read channel. Sandusky does *not*, however, disclose or suggest the feature of *limiting* a voltage drop across at least one of the input and output switches *to an offset voltage of an amplifier connected to the capacitive element*.

Thus, Sandusky et al. do not disclose or suggest an amplifier connected to said node, wherein said amplifier has an offset voltage and wherein a voltage drop across at least one of said input and output switches is limited to said offset voltage, as required by independent claim 1, and do not disclose or suggest limiting a voltage drop across at least one of said input and output switches to an offset voltage of an amplifier connected to said at least one capacitive element, as required by independent claim 8.

Conclusion

The rejections of the cited claims under sections 102 and 103 in view of Luo, Beauducel et al., Mills et al. and Sandusky et al., alone or in combination, are therefore believed to be improper and should be withdrawn. The remaining rejected dependent claims are believed allowable for at least the reasons identified above with respect to the independent claims.

The attention of the Examiner and the Appeal Board to this matter is appreciated.

Respectfully,



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APPENDIX

1. A sample and hold circuit having an input and an output, comprising:
 - at least one capacitive element for retaining a charge, said at least one capacitive
 - 5 element connected to a node between said input and said output;
 - at least one input switch for selectively connecting said at least one capacitive element to said input;
 - at least one output switch for selectively connecting said at least one capacitive element to said output; and
 - 10 an amplifier connected to said node, wherein said amplifier has an offset voltage and wherein a voltage drop across at least one of said input and output switches is limited to said offset voltage.
2. The sample and hold circuit of claim 1, wherein said sample and hold circuit is
- 15 part of a preamplifier for a head bias circuit in a storage system.
3. The sample and hold circuit of claim 1, wherein at least one of said input and output switches has a leakage effect represented by a resistor in parallel with said input or output switch and a voltage drop across said resistor is limited to said offset voltage
- 20
4. The sample and hold circuit of claim 1, further comprising at least two switches associated with at least one of said input and output switches, wherein said at least two switches selectively connect at least one of said input and output switches to an output of said amplifier in a hold mode or standard voltages in a write mode to reduce leakage effects due to parasitic
- 25 diodes in said at least one of said input and output switches.
5. The sample and hold circuit of claim 1, wherein said output provides a DC bias for a magneto-resistive head in a disk drive.

6. The sample and hold circuit of claim 1, wherein said sample and hold circuit provides a hold time of at least approximately 200 microseconds.

7. The sample and hold circuit of claim 1, wherein said limited voltage drop across at least one of said input and output switches reduces a leakage of said sample and hold circuit.

8. A method for reducing leakage in a sample and hold circuit having at least one capacitive element for retaining a charge, said method comprising the steps of:

configuring at least one input switch to selectively connect said at least one capacitive element to said input;

configuring at least one output switch to selectively connect said at least one capacitive element to said output; and

limiting a voltage drop across at least one of said input and output switches to an offset voltage of an amplifier connected to said at least one capacitive element

9. The method of claim 8, wherein said sample and hold circuit is part of a preamplifier for a head bias circuit in a storage system.

10. The method of claim 8, wherein at least one of said input and output switches has a leakage effect represented by a resistor in parallel with said input or output switch and a voltage drop across said resistor is limited to said offset voltage

11. The method of claim 8, further comprising the steps of configuring at least two switches associated with at least one of said input and output switches, wherein said at least two switches selectively connect at least one of said input and output switches to an output of said amplifier in a hold mode or standard voltages in a write mode to reduce leakage effects due to parasitic diodes in said at least one of said input and output switches.

12. The method of claim 8, wherein said sample and hold circuit provides a hold time of at least approximately 200 microseconds.

13. The method of claim 8, wherein said step of limiting a voltage drop across at least one of said input and output switches reduces a leakage of said sample and hold circuit.

14. A disk drive, comprising:

5 a magneto-resistive read head; and

a sample and hold circuit having an input and an output, comprising:

(i) at least one capacitive element for retaining a charge, said at least one capacitive element connected to a node between said input and said output;

10 (ii) at least one input switch for selectively connecting said at least one capacitive element to said input;

(iii) at least one output switch for selectively connecting said at least one capacitive element to said output; and

15 (iv) an amplifier connected to said node, wherein said amplifier has an offset voltage and wherein a voltage drop across at least one of said input and output switches is limited to said offset voltage.

15. The disk drive of claim 14, wherein said sample and hold circuit is part of a preamplifier for a head bias circuit in a storage system.

20 16. The disk drive of claim 14, wherein at least one of said input and output switches has a leakage effect represented by a resistor in parallel with said input or output switch and a voltage drop across said resistor is limited to said offset voltage.

25 17. The disk drive of claim 14, further comprising at least two switches associated with at least one of said input and output switches, wherein said at least two switches selectively connect at least one of said input and output switches to an output of said amplifier in a hold mode or standard voltages in a write mode to reduce leakage effects due to parasitic diodes in said at least one of said input and output switches.

18. The disk drive of claim 14, wherein said output provides a DC bias for a magneto-resistive head in said disk drive.

19. The disk drive of claim 14, wherein said sample and hold circuit provides a hold
5 time of at least approximately 200 microseconds.

20. The disk drive of claim 14, wherein said limited voltage drop across at least one of said input and output switches reduces a leakage of said sample and hold circuit.

EVIDENCE APPENDIX

There is no evidence submitted pursuant to § 1.130, 1.131, or 1.132 or entered by the Examiner and relied upon by appellant

RELATED PROCEEDINGS APPENDIX

There are no known decisions rendered by a court or the Board in any proceeding identified pursuant to paragraph (c)(1)(ii) of 37 CFR 41.37.